

**CLAIMS:**

1. A cellulosic based substrate or matrix for  
controlling flying insects, the cellulosic based substrate  
5 or matrix impregnated and/or dosed with a vapour active  
pyrethroid in a carrier solvent,

wherein the cellulosic based substrate or matrix has  
a surface area in the range of 50-5000 cm<sup>2</sup>, the vapour  
active pyrethroid is selected from the group consisting of  
10 metofluthrin, transfluthrin, empenethrin, methothrin,  
tefluthrin, and fenfluthrin or mixtures thereof and is  
present in an amount of approximately 2.0-3000 mg/m<sup>2</sup>, and  
the carrier solvent has an evaporation rate according to  
ASTM D3539-87 of less than approximately 1.0, a boiling  
15 point in the range of approximately 120-330°C and a Snyder  
polarity index in the range of approximately 0.0-4.0;

such that the vapour active pyrethroid is emanated  
into an environment with non-augmented air movement at a  
rate of at least approximately 0.040 mg/h at a temperature  
20 in the range of approximately 18-40°C.

2. The cellulosic based substrate or matrix according  
to claim 1, wherein the solvent is selected from the group  
consisting of normal paraffins with a boiling point range  
25 of about 155-276°C, dearomatised aliphatic hydrocarbons  
and their blends in the boiling point range of about 150-  
265°C, isoparaffins in the boiling point range of about  
150-300°C and glycol ethers in the boiling point range of  
about 120-243°C.

3. The cellulosic based substrate or matrix according to claim 1 or 2 wherein the carrier solvent has a boiling point in the range of approximately 150-265°C.

5       4. A cellulosic based substrate or matrix for controlling flying insects, the cellulosic based substrate or matrix impregnated and/or dosed with an insecticidally effective amount of a vapour active pyrethroid in a carrier solvent, wherein the vapour active pyrethroid is  
10 selected from the group consisting of metofluthrin, transfluthrin, empenethrin, methothrin, tefluthrin, and fenfluthrin or mixtures thereof and the carrier solvent has an evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling point in the range of  
15 approximately 120-330°C and a polarity index in the range of approximately 0.0-4.0, such that the vapour active pyrethroid is emanated into the environment at a rate of at least approximately 0.040 mg/h.

20       5. The cellulosic based substrate or matrix according to claim 4, wherein the vapour active pyrethroid is metofluthrin.

6. The cellulosic based substrate or matrix according  
25 to any one of claims 1-5 wherein the cellulosic based substrate or matrix is impregnated and/or dosed with a vapour active pyrethroid in an amount of approximately 16-320 mg/m<sup>2</sup> of the substrate or matrix surface area

30       7. The cellulosic based substrate or matrix according to claim 6 wherein the vapour active pyrethroid is in an amount of approximately 130-320 mg/m<sup>2</sup>.

8. The cellulosic based substrate or matrix according to any one of claims 1-5 wherein the cellulosic based substrate or matrix is impregnated and/or dosed with a vapour active pyrethroid in an amount of approximately 48-960 mg/m<sup>2</sup> of the substrate or matrix surface area.

9. The cellulosic based substrate or matrix according to claim 8 wherein the vapour active pyrethroid is in an amount of approximately 390-960 mg/m<sup>2</sup>.

10. The cellulosic based substrate or matrix according to any one of claims 1-5 wherein the cellulosic based substrate or matrix is impregnated and/or dosed with a vapour active pyrethroid in an amount of approximately 144-2880 mg/m<sup>2</sup> of the substrate or matrix surface area.

11. The cellulosic based substrate or matrix according to claim 10 wherein the vapour active pyrethroid is in an amount of approximately 1170-2880 mg/m<sup>2</sup>.

12. The cellulosic based substrate or matrix according to any one of claims 1-11 wherein the vapour active pyrethroid is emanated into the environment at a temperature in the range of approximately 21-40°C.

13. The cellulosic based substrate or matrix according to any one of claims 1 to 12 wherein the vapour active pyrethroid is emanated into the environment at a rate of at least approximately 0.075 mg/h.

14. The cellulosic based substrate or matrix according to any one of claims 1-13 wherein the vapour active pyrethroid is emanated into the environment at a rate of at least approximately 0.075 mg/h at a temperature in the  
5 range of approximately 21-35°C.

15. The cellulosic based substrate or matrix according to any one of claims 1 to 14 wherein the cellulosic based substrate or matrix has a grammage in the range of  
10 approximately 12 gsm to less than 260 gsm.

16. The cellulosic based substrate or matrix according to claim 15, wherein the cellulosic based substrate or matrix has a grammage of approximately 18 gsm to 40 gsm.  
15

17. The cellulosic based substrate or matrix according to any one of claims 1 to 16 wherein the cellulosic based substrate or matrix is a paper substrate having a grammage of approximately 18 gsm.  
20

18. The cellulosic based substrate or matrix according to any one of claims 1 to 17, wherein the cellulosic based substrate or matrix is in the form of a honeycomb arrangement.  
25

19. The cellulosic based substrate or matrix according to claim 18, wherein the honeycomb arrangement has two ends that are attached to a protective material into which the vapour active pyrethroid cannot migrate and/or be  
30 absorbed.

20. The cellulosic based substrate or matrix according to claim 19, wherein the honeycomb arrangement has an open form that allows emanation of the vapour active pyrethroid into the atmosphere and a closed form which inhibits migration and/or absorption of the vapour active pyrethroid into the atmosphere.

21. The cellulosic based substrate or matrix according to any one of claims 1-20 wherein the flying insects are controlled by knockdown.

22. The cellulosic based substrate or matrix according to any one of claims 1-21 wherein the flying insects are mosquitoes.

15

23 A flying insect control article comprising:

a) a cellulosic based substrate or matrix with a surface area in the range of 50-5000 cm<sup>2</sup> impregnated and/or dosed with a solution of vapour active pyrethroid in an amount of approximately 2.0-3000 mg/m<sup>2</sup> in a carrier solvent, wherein the vapour active pyrethroid is selected from the group consisting of metofluthrin, transfluthrin, empenethrin, methothrin, tefluthrin, and fenfluthrin or mixtures thereof and the carrier solvent has an evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling point in the range of approximately 120-330°C and a Snyder polarity index in the range of approximately 0.0-4.0;

the cellulosic based substrate or matrix impregnated and/or dosed with the vapour active pyrethroid in an amount such that the vapour active pyrethroid is emanated into an environment with non-augmented air movement at a

rate of at least approximately 0.040 mg/h at a temperature in the range of approximately 18-40°C; and

b) a protective material that is attached to the cellulosic based substrate or matrix into which protective material the vapour active pyrethroid does not migrate and/or is not absorbed;

wherein the cellulosic based substrate and/or matrix exists in a closed and open form such that when in the open form the pyrethroid is able to emanate from the substrate into the environment and when in the closed form the protective material covers the substrate or matrix to minimise emanation of the pyrethroid into the environment.

24. The insect control article according to claim 23 wherein the solvent is selected from the group consisting of normal paraffins with a boiling point range of about 155-276°C, dearomatised aliphatic hydrocarbons and their blends in the boiling point range of about 150-265°C, isoparaffins in the boiling point range of about 150-300°C and glycol ethers in the boiling point range of about 120-243°C.

25. The insect control article according to claim 23 or 24 wherein the carrier solvent has a boiling point in the range of approximately 150-265°C.

26. A flying insect control article comprising:

a) a cellulosic based substrate or matrix for controlling flying insects, the cellulosic based substrate or matrix impregnated and/or dosed with an insecticidally effective amount of a vapour active pyrethroid in a

carrier solvent, wherein the vapour active pyrethroid is selected from the group consisting of metofluthrin, transfluthrin, empenethrin, methothrin, tefluthrin, and fenfluthrin or mixtures thereof and the carrier solvent  
5 has an evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling point in the range of approximately 120-330°C and a polarity index in the range of approximately 0.0-4.0 such that the vapour active pyrethroid is emanated into the environment at a rate of  
10 at least approximately 0.040 mg/h; and

b) a protective material that is attached to the cellulosic based substrate or matrix into which protective material the vapour active pyrethroid does not migrate and/or is not absorbed;

15 wherein the cellulosic based substrate and/or matrix exists in a closed and open form such that when in the open form the pyrethroid is able to emanate from the substrate into the environment and when in the closed form the protective material covers the substrate or matrix to  
20 minimise emanation of the pyrethroid into the environment.

27. The insect control article according to claim 26, wherein the vapour active pyrethroid is metofluthrin

25 28. The insect control article according to claim 26 or 27, wherein the cellulosic based substrate or matrix is in the form of a honeycomb arrangement.

29. The insect control article according to claim 28,  
30 wherein the honeycomb arrangement has two ends that are attached to the protective material.

30. A packaged flying insect control article comprising:

- a) a cellulosic based substrate or matrix with a surface area in the range of 50-5000 cm<sup>2</sup> impregnated and/or dosed with a solution of vapour active pyrethroid in an amount of approximately 2.0-3000 mg/m<sup>2</sup> in a carrier solvent, wherein the vapour active pyrethroid is selected from the group consisting of metofluthrin, transfluthrin, empenethrin, methothrin, tefluthrin, and fenfluthrin or mixtures thereof and the carrier solvent has an evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling point in the range of approximately 120-330°C and a Snyder polarity index in the range of approximately 0.0-4.0;
- the cellulosic based substrate or matrix impregnated and/or dosed with the vapour active pyrethroid in an amount such that the vapour active pyrethroid is emanated into a non-augmented environment at a rate of at least approximately 0.040 mg/h at a temperature in the range of approximately 18-40°C; and
- b) a packaging material enclosing the cellulosic based substrate or matrix into which material the vapour active pyrethroid does not migrate and/or is not absorbed; wherein when the packaging material enclosing the cellulosic based substrate or matrix is removed from around the cellulosic based substrate or matrix, the vapour active pyrethroid is free to emanate from the cellulosic based substrate or matrix exposed to the environment to control flying insects.

30

31. The insect control device according claim 30 wherein the solvent is selected from the group consisting

BEST AVAILABLE COPY



of normal paraffins with a boiling point range of about 155-276°C, dearomatised aliphatic hydrocarbons and their blends in the boiling point range of about 150-265°C, isoparaffins in the boiling point range of about 150-300°C  
5 and glycol ethers in the boiling point range of about 120-243°C.

32. The packaged flying insect control article according to claim 30 or 31 wherein the carrier solvent  
10 has an evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling point in the range of approximately 150-265°C.

33. A packaged flying insect control article  
15 comprising:

a) a cellulosic based substrate or matrix for controlling flying insects, the cellulosic based substrate or matrix impregnated and/or dosed with an insecticidally effective amount of a vapour active pyrethroid in a  
20 carrier solvent, wherein the vapour active pyrethroid is selected from the group consisting of metofluthrin, transfluthrin, empenethrin, methothrin, tefluthrin, and fenfluthrin or mixtures thereof and the carrier solvent has an evaporation rate according to ASTM D3539-87 of less  
25 than approximately 1.0, a boiling point in the range of approximately 120-330°C and a polarity index in the range of approximately 0.0-4.0 such that the vapour active pyrethroid is emanated into the environment at a rate of at least approximately 0.040 mg/h; and

b) a packaging material enclosing the cellulosic based substrate or matrix into which material the vapour active pyrethroid does not migrate and/or is not absorbed;

wherein when the packaging material enclosing the  
5 cellulosic based substrate or matrix is removed from around the cellulosic based substrate or matrix, the vapour active pyrethroid is free to emanate from the cellulosic based substrate or matrix exposed to the environment to control flying insects.

10

34. The insect control device according to claim 33, wherein the vapour active pyrethroid is metofluthrin.

35. A stable flying insect control article comprising:  
15 a cellulosic based substrate or matrix with a surface area in the range of 50-5000 cm<sup>2</sup>, wet with a solution of vapour active pyrethroid in an amount of approximately 2.0-3000 mg/m<sup>2</sup> of the surface area and a carrier solvent, enclosed by a packaging material;

20 wherein the vapour active pyrethroid is selected from the group consisting of metofluthrin, transfluthrin, empenethrin, methothrin, tefluthrin, and fenfluthrin or mixtures thereof and the carrier solvent has an evaporation rate according to ASTM D3539-87 of less than  
25 approximately 1.0, a boiling point in the range of approximately 120-330°C and a Snyder polarity index in the range of approximately 0.0-4.0;

such that the vapour active pyrethroid emanates from the cellulosic substrate or matrix into a non-augmented  
30 environment at a rate of at least approximately 0.040 mg/h at a temperature in the range of approximately 18-40°C but

does not migrate and/or is not absorbed into the packaging material.

36. The insect control article according to any one of  
5 claims 41-42 wherein the solvent is selected from the group consisting of normal paraffins with a boiling point range of about 155-276°C, dearomatised aliphatic hydrocarbons and their blends in the boiling point range of about 150-265°C, isoparaffins in the boiling point  
10 range of about 150-300°C and glycol ethers in the boiling point range of about 120-243°C.

37. The stable flying insect control article according to claim 35 or 36 wherein the carrier solvent has a  
15 boiling point in the range of approximately 150-265°C.

38. A stable flying insect control article comprising:  
a cellulosic based substrate or matrix wet with a solution of an insecticidally effective amount of a vapour  
20 active pyrethroid selected from the group consisting of metofluthrin, transfluthrin, empenethrin, methothrin, tefluthrin, and fenfluthrin or mixtures thereof and a carrier solvent having an evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling  
25 point in the range of approximately 120-330°C and a polarity index in the range of approximately 0.0-4.0, enclosed by a packaging material;

wherein the vapour active pyrethroid emanates from the cellulosic substrate or matrix into the environment at  
30 a rate of at least approximately 0.040 mg/h but does not

migrate and/or is not absorbed into the packaging material.

39. The insect control article according to claim  
5 38, wherein the vapour active pyrethroid is metofluthrin.

40. The insect control article according to any one of  
claims 23 to 39 wherein the vapour active pyrethroid is  
emanated into the atmosphere at a rate of at least  
10 approximately 0.075 mg/h at a temperature in the range of  
about 21-35°C.

41. The insect control article according to any one of  
claims 23 to 40 wherein the cellulosic based substrate or  
15 matrix has a grammage within the range of approximately 12  
gsm to less than 260 gsm.

42. The insect control article according to any one of  
claims 23 to 41 wherein the cellulosic based substrate or  
20 matrix is a paper substrate with a grammage of about 18  
gsm.

43. The packaged insect control device or insect  
control article according to any one of claims 30 to 39,  
25 wherein the cellulosic based substrate or matrix is in the  
form of a paper honeycomb arrangement.

44. The insect control device according to claim 43,  
wherein the honeycomb arrangement has two ends that are  
30 attached to material through which the vapour active  
pyrethroid cannot migrate.

BEST AVAILABLE COPY

45. The insect control device according to claim 44, wherein the honeycomb arrangement has an open form that allows emanation of the vapour active pyrethroid into the atmosphere and a closed form which inhibits migration of  
5 the vapour active pyrethroid into the atmosphere.

46. The insect control article according to any one of claims 23 to 45, wherein the protective material and packaging material is selected from the group including  
10 metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-methyl acrylate copolymers and laminates thereof.

47. The insect control article according to any one of  
15 claims 23 to 45, wherein the protective material and packaging material is metal foil and laminates thereof.

48. The insect control article according to any one of claims 23 to 45, wherein the protective material and  
20 packaging material is glass.

49 A flying insect control article comprising:

a) a cellulosic based substrate or matrix with a surface area in the range of 50-5000 cm<sup>2</sup> impregnated  
25 and/or dosed with a solution of vapour active pyrethroid in an amount of approximately 2.0-3000 mg/m<sup>2</sup> in a carrier solvent, the cellulosic based substrate or matrix impregnated and/or dosed with the vapour active pyrethroid in an amount such that the vapour active pyrethroid is  
30 emanated into an environment with non-augmented air movement at a rate of at least approximately 0.040 mg/h at a temperature in the range of approximately 18-40°C; and

b) a protective material that is attached to the cellulosic based substrate or matrix into which protective material the vapour active pyrethroid does not migrate and/or is not absorbed;

5 wherein

the protective material and packaging material is selected from the group including metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-methyl acrylate copolymers  
10 and laminates thereof; metal foil and laminates thereof; and glass; and

the cellulosic based substrate and/or matrix exists in a closed and open form such that when in the open form the pyrethroid is able to emanate from the substrate into  
15 the environment and when in the closed form the protective material covers the substrate or matrix to minimise emanation of the pyrethroid into the environment.

50. A flying insect control article comprising:

20 a) a cellulosic based substrate or matrix for controlling flying insects, the cellulosic based substrate or matrix impregnated and/or dosed with an insecticidally effective amount of a vapour active pyrethroid in a carrier solvent, wherein the carrier solvent has an  
25 evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling point in the range of approximately 120-330°C and a polarity index in the range of approximately 0.0-4.0 such that the vapour active pyrethroid is emanated into the environment at a rate of  
30 at least approximately 0.040 mg/h; and

b) a protective material that is attached to the cellulosic based substrate or matrix into which protective

material the vapour active pyrethroid does not migrate and/or is not absorbed;

wherein

- the protective material and packaging material is
- 5 selected from the group including metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-methyl acrylate copolymers and laminates thereof; metal foil and laminates thereof; and glass; and
- 10 the cellulosic based substrate and/or matrix exists in a closed and open form such that when in the open form the pyrethroid is able to emanate from the substrate into the environment and when in the closed form the protective material covers the substrate or matrix to minimise
- 15 emanation of the pyrethroid into the environment.

51. A packaged flying insect control article comprising:

- a) a cellulosic based substrate or matrix with a
- 20 surface area in the range of 50-5000 cm<sup>2</sup> impregnated and/or dosed with a solution of vapour active pyrethroid in an amount of approximately 2.0-3000 mg/m<sup>2</sup> in a carrier solvent, the cellulosic based substrate or matrix impregnated and/or dosed with the vapour active pyrethroid
- 25 in an amount such that the vapour active pyrethroid is emanated into a non-augmented environment at a rate of at least approximately 0.040 mg/h at a temperature in the range of approximately 18-40°C; and
- b) a packaging material enclosing the cellulosic
- 30 based substrate or matrix into which material the vapour active pyrethroid does not migrate and/or is not absorbed;

wherein the protective material and packaging material is selected from the group including metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-methyl acrylate  
5 copolymers and laminates thereof; metal foil and laminates thereof; and glass; and

such that when the packaging material enclosing the cellulosic based substrate or matrix is removed from around the cellulosic based substrate or matrix, the  
10 vapour active pyrethroid is free to emanate from the cellulosic based substrate or matrix exposed to the environment to control flying insects.

52. A packaged flying insect control article  
15 comprising:

a) a cellulosic based substrate or matrix for controlling flying insects, the cellulosic based substrate or matrix impregnated and/or dosed with an insecticidally effective amount of a vapour active pyrethroid in a  
20 carrier solvent, such that the vapour active pyrethroid is emanated into the environment at a rate of at least approximately 0.040 mg/h; and

b) a packaging material enclosing the cellulosic based substrate or matrix into which material the vapour  
25 active pyrethroid does not migrate and/or is not absorbed;

wherein the protective material and packaging material is selected from the group including metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-methyl acrylate  
30 copolymers and laminates thereof; metal foil and laminates thereof; and glass; and



such that when the packaging material enclosing the cellulosic based substrate or matrix is removed from around the cellulosic based substrate or matrix, the vapour active pyrethroid is free to emanate from the  
5 cellulosic based substrate or matrix exposed to the environment to control flying insects.

53. A stable flying insect control article comprising:  
a cellulosic based substrate or matrix with a surface  
10 area in the range of 50-5000 cm<sup>2</sup>, wet with a solution of vapour active pyrethroid in an amount of approximately 2.0-3000 mg/m<sup>2</sup> of the surface area and a carrier solvent, enclosed by a packaging material;

wherein the protective material and packaging  
15 material is selected from the group including metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-methyl acrylate copolymers and laminates thereof; metal foil and laminates thereof; and glass; and

20 such that the vapour active pyrethroid emanates from the cellulosic substrate or matrix into a non-augmented environment at a rate of at least approximately 0.040 mg/h at a temperature in the range of approximately 18-40°C but does not migrate and/or is not absorbed into the packaging  
25 material.

54. A stable flying insect control article comprising:  
a cellulosic based substrate or matrix wet with a solution of an insecticidally effective amount of a vapour  
30 active pyrethroid and a carrier solvent having an evaporation rate according to ASTM D3539-87 of less than approximately 1.0, a boiling point in the range of

approximately 120-330°C and a polarity index in the range of approximately 0.0-4.0, enclosed by a packaging material;

wherein the protective material and packaging material is selected from the group including metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-methyl acrylate copolymers and laminates thereof; metal foil and laminates thereof; and glass; and

such that the vapour active pyrethroid emanates from the cellulosic substrate or matrix into the environment at a rate of at least approximately 0.040 mg/h but does not migrate and/or is not absorbed into the packaging material.

15

55. A method for controlling flying insects comprising the steps of:

providing the cellulosic based substrate or matrix or insect control article according to any one of claims 1 to

20 54;

b) exposing the cellulosic based substrate or matrix in an environment with non-augmented air movement; and

c) allowing the vapour active pyrethroid impregnated within and/or dosed on the cellulosic based substrate or matrix to passively emanate into the air.

56 The insect control article of anyone of claims 23-54 and the method according to claim 55 wherein the vapour active pyrethroid emanates into the atmosphere to knockdown flying insects.

BEST AVAILABLE COPY

57 The insect control article of anyone of claims 23-54 and the method according to claim 55 wherein the flying insects are mosquitoes.

5 58. A method of packaging a cellulosic based substrate or matrix or insect control article according to any one of claims 1 to 54 comprising the steps of:

providing a packaging material through which the vapour active pyrethroid does not migrate and/or is not  
10 absorbed;

forming a pouch with the packaging material;

filling the pouch with the cellulosic based substrate or matrix or insect control article; and

sealing the pouch.

15

59. The method according to claim 58 wherein the packaging material is selected from the group consisting of metalised polyester, heat sealed polyester films, polyester based film and formed sheet and acrylonitrile-  
20 methyl acrylate copolymers and laminates thereof, metal foil and laminates thereof and glass.